Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form

1. Applying for (select one):

☐ (a) Prop 13 Urban Water Conservation Capital Outlay Grant

☒ (b) Prop 13 Agricultural Water Conservation Capital Outlay Feasibility Study Grant

☐ (c) DWR Water Use Efficiency Project

2. Principal applicant (Organization or affiliation): San Jacinto Basin Resource Conservation District

3. Project Title: Feasibility of retrofitting to a remote-sensing soil moisture monitoring and irrigation scheduling system for Temecula Valley Winegrape Growers

4. Person authorized to sign and submit proposal:

Name, title: Jim Gilmore
Irrigation Lab Program Manager

Mailing address: 950 N. Ramona Blvd., Suite 6
San Jacinto, CA 92582

Telephone: 909/654-7733

Fax: 909/654-5334

E-mail: sjbrcd@pe.net

5. Contact person (if different):

Name, title: N/A

Mailing address: ----------

Telephone: ----------

Fax: ----------

E-mail: ----------

6. Funds requested (dollar amount): $98,033

7. Applicant funds pledged (dollar amount): Value of in-place systems (see Scope)

8. Total project costs (dollar amount): $98,033

9. Estimated total quantifiable project benefits (dollar amount): To be determined (Feasibility Study)

Percentage of benefit to be accrued by applicant: To be determined (Feasibility Study)

Percentage of benefit to be accrued by CALFED or others: To be determined (Feasibility Study)

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
A. Project Information Form (continued)

10. Estimated annual amount of water to be saved (acre-feet): 458-1,300

    Estimated total amount of water to be saved (acre-feet): To be determined: (Feasibility Study)

    Over _____ years

    Estimated benefits to be realized in terms of water quality, instream flow, other: Reduced NO_3-N contamination of groundwater due to improved IE.

11. Duration of project (month/year to month/year): Oct. '02 through Oct. '03

12. State Assembly District where the project is to be conducted: 64

13. State Senate District where the project is to be conducted: 36

14. Congressional district(s) where the project is to be conducted; 43, 44

15. County where the project is to be conducted: Riverside

16. Date most recent Urban Water Management Plan submitted to the Department of Water Resources: N/A

17. Type of applicant (select one):
    Proposition 13 Urban Grants and Prop 13 Agricultural Feasibility Study Grants:

- ☐ (a) city
- ☐ (b) county
- ☐ (c) city and county
- ☐ (d) joint power authority
- ☒ (e) other political subdivision of the State, including public water district
- ☐ (f) incorporated mutual water company

    DWR WUE Projects: the above Entities (a) through (f) or:

- ☐ (g) investor-owned utility
- ☐ (h) non-profit organization
- ☐ (I) tribe
- ☐ (j) university
- ☐ (k) state agency
- ☐ (l) federal agency

18. Project focus:

- ☒ (a) agricultural
- ☐ (b) urban

Consolidated Water Use Efficiency 2002 PSP
Proposal Part One:
B. Project Information Form (continued)

19. Project type (select one):
Prop 13 Urban Grant or Prop 13 Agricultural Feasibility Study Grant
Capital outlay project related to:

- ☐ (a) implementation of Urban Best Management Practices
- ☒ (b) implementation of Agricultural Efficient Water Management Practices
- ☐ (c) implementation of Quantifiable Objectives (include QO number(s)

- ☐ (d) other (specify)

DWR WUE Project related to:

- ☐ (e) implementation of Urban Best Management Practices
- ☐ (f) implementation of Agricultural Efficient Water Management Practices
- ☐ (g) implementation of Quantifiable Objectives (include QO number(s)

- ☐ (h) innovative projects (initial investigation of new technologies, methodologies, approaches or institutional frameworks)
- ☐ (i) research or pilot projects
- ☐ (j) education or public information programs
- ☐ (k) other (specify)

  ---

20. Do the actions in this proposal involve Physical changes in land use, or potential future changes in land use?

- ☐ (a) yes
- ☒ (b) no

If yes, the applicant must complete the CALFED PSP Land Use Checklist found at http://calfed.water.ca.gov/environmental_docs.html and submit it with the proposal.

PROPOSAL PART TWO
Project Summary

The purpose of this project is to study the feasibility, for the Temecula Valley Winegrowers Association, of augmenting an existing Adcon weather station network with the equipment necessary to convert from a "manual" soil-moisture-monitoring/irrigation scheduling system to a remote-sensing network. At present, this 2,500-acre growing region is serviced by nearly 100 soil moisture-monitoring sites which are checked weekly during grape season (May-Oct) by a two-man team using a portable TDR moisture gauge. Readings are downloaded to PRISM (Precision Irrigation Scheduling Method) software which generates a weekly irrigation schedule for participating cooperators. The PRISM system, implemented in 1998, has been responsible for a 9.5-percent reduction in water use (~ 415 AF) annually. Under auspices of the Department of Pesticide Regulation, an eight-station Adcon weather station network (to monitor and compute a powdery mildew risk index) was installed in 1996. With new "C-Probe" technology, the capability now exists to convert our existing, labor-intensive PRISM system to the more efficient (but significantly more expensive) remote sensing C-Probe system by retrofitting to the Adcon network.The question is, will the combination of potential water savings and reduction in labor costs be sufficient to justify conversion of the 100-site PRISM system to the remote-sensing C-Probe network?

This feasibility study will be conducted in an environment which has seen Temecula Valley growers suffer losses ranging from 30 to 50 percent of mature vines due to the devastating effects of an especially virulent form of Pierce's Disease (PD), first detected in the Valley in 1997. Although the disease and its vector, the Glassy-Winged Sharpshooter (GWSS), now appear to be under control, growers are under extreme pressure to cut costs and boost revenues from surviving healthy vines while waiting for newly planted, replacement vineyards to come into production (three to four years).

The study network, to be comprised of 28 strategically sited stations, will play a pivotal role in implementation of a regulated deficit irrigation (RDI) program study designed to improve winegrape quality and related revenues without sacrificing yield. Components of the RDI study include the remote-sensing network proposed here, in combination with vine moisture stress monitoring using a portable pressure chamber to measure leaf moisture potential against a set of standards indicative of winegrape quality. The latter program is being supported for the 2002 growing season by a $40,000-grant from the U.S. Bureau of Reclamation. Both components are needed to implement efficiently the RDI study. If successful, annual water savings are estimated within the range of 458-1,300 AF ($183,200-$520,000). Labor savings related to the existing PRISM program would be on the order of $45,000 per season. Premium winegrape prices are difficult to estimate give market factors unrelated to this study but program-related improvements on the order of $200-$400/ton (depending on variety) are not unreasonable. Projected over the growing region, this suggests a potential revenue increase of $2-$4 million.

A. Scope of Work: Relevance of Project

1. Nature, Scope and Objectives of the Project

   This project will explore the feasibility of converting an existing soil moisture monitoring and winegrape irrigation scheduling system (PRISM) comprised of 100 access tubes/monitoring sites with a remote sensing C-Probe system offering improved accuracy and real-time, continuous monitoring capability including actual start and stop irrigation times for project management units. Twenty-eight (28) C-Probe sites/sensors would be installed in management units with soils representative of those found in the 2,500-acre Temecula Valley growing region. An existing network of eight Adcon weather stations and base station, originally installed in the mid-90s to monitor Powdery Mildew risk factors, would be retrofitted with the equipment and software necessary to permit C-Probe moisture and flow rate data to be transmitted to and processed by the existing base station. Specific equipment items are detailed in the project budget. While the existing PRISM system advanced significantly irrigation water management for participating growers, monitoring of the stations is labor intensive requiring approximately 20 man-hours weekly to collect the data using a portable TDR-type moisture gauge. An additional 5-8 man hours weekly is required to download the data and to prepare and transmit weekly irrigation schedules for 100 management units. The objective of this project will be to determine whether labor savings and reduced water costs associated with the C-Probe test system justify the cost of expanding that system to the scale required and the extent to which network expansion might qualify for a Proposition 13 Agricultural Water Conservation Loan.

2. Critical Issues; Consistency with Local, Regional Water Management Plans

   Temecula Valley winegrape growers have been decimated in recent years by an especially virulent form of Pierce Disease causing the loss of 30 to 50 percent of mature vines. The disease is transmitted by an extremely aggressive vector, the Glassy-winged Sharpshooter (GWSS) which gained a foothold in the Valley in 1996-1997. Endemic to the southeastern U.S., it is believed the insect was transported to southern California via nursery stock imported into the area to support booming residential and commercial development in the region. Its spread northward constitutes the most significant threat to California's winegrape industry in its history resulting in formation of a multi-agency State Task Force to combat the disease. Temecula Valley growers have weathered the onslaught and, in cooperation with the Task Force have managed to bring the disease and its vector, the GWSS, under control; but much remains to be done. With the GWSS under control, replanting of decimated vineyards has begun. Growers must now absorb replanting and cultural costs for three to four years before the new vines come into production. Accordingly, they are under extreme pressure to cut costs wherever possible and to optimize revenues from remaining mature vines. In the face of losses already absorbed, they need assistance in acquiring new technologies which will allow them to successfully meet the challenges of vineyard redevelopment.

This project is consistent with BMPs developed by the State Agricultural Water Management Task Force which call for the implementation of practices which improve irrigation efficiency with an eye toward the need for water conservation as well as the protection of ground and surface from contamination by nitrates and other agricultural chemicals being carried by runoff or deep percolation of inefficiently applied irrigation water. The project area lies in the Santa Margarita River Watershed which embraces the last free-flowing river in southern California. The river is listed as impaired due to contamination by agricultural chemicals including leachable nitrates. Accordingly, the upper watershed which includes the wine country is considered a potential source of contamination and a target for implementation of agricultural efficient water management practices by the San Diego Regional Board, the Santa Margarita River Water Master, Rancho California Water District and the Santa Margarita River Watershed Council.

B. Scope of Work: Technical/Scientific Merit and Feasibility

1. Methods, Procedures and Facilities

Preliminary planning for this project has already been completed in cooperation with the Viticulture and Enology Research Committee (VERC) of the Temecula Valley Winegrowers Association; the San Jacinto Basin RCD Irrigation Water and Nutrient Management Lab and Western Farm Services, the exclusive distributor and customer service entity for the Adcon/C-Probe network equipment which is the subject of this proposal. Western Farm estimates that the complete test network of remote monitoring C-Probes, "Add-It" components, flow meters, relay stations and software upgrades can be installed in one week. The SJBRCD Irrigation Lab staff has operated the existing PRISM system for three seasons and is well versed in the fundamentals of irrigation scheduling using soil moisture monitoring technology. Data manipulation using the new C-Probe system is similar with the exception of the availability of continuous monitoring capability and flow data. The new system, accordingly, will require relatively minimal training. For purposes of the study, project proponents will compare side-by-side data output from each system during the 2003 season.

The C-Probe system is to be combined with technology that measures leaf water potential (LWP) using a pressure chamber ("pressure bomb") as an indicator of vine moisture stress. The imposition of mild to moderate stress from bloom to veraison is an important cultural practice in the production of premium winegrapes, particularly red varieties. This new level of technology will be piloted in the coming 2002 growing season under auspices of a $40,000 grant from the U.S. Bureau of Reclamation which is renewable for 2003. Pressure chamber technology forms the objective basis via established standards for regulated deficit irrigation practices. Imposition of these factors should result in a reduction of applied irrigation water ranging from 20 to 40 percent, depending on variety. The real time moisture monitoring capability of the C-Probe system provides a means of correlating soil moisture content with leaf water potential at the time the measurement is taken. Conversely, we will be able to measure the magnitude of vine response (in terms of LWP) to periodic

adjustments in applied water. Having this component of the RDI system in place prior to implementation of the C-Probe project will enhance our readiness for the 2003 season

2. Task List and Schedule

Task**	Timeline	Evidence of Completion (Deliverables)	Projected Cos
-Probe siting	Completed	Location List	0.0
rower briefing re: roposed project	April 6, 2002	Conference Agenda	0.0
dcon/C-Probe equipment nstallation	October 6-17, 2003	Project invoice; field verification	75,00
ystem de-bugging	October 17-January 31	Western Farm Certification	1,40
ield maintenance and omputer training	February 1-28	SJBRCD Certification	1,40
rogram ops: Moisture easurements begin	March 15, 2003 (estimated bud break)	Moisture data record	
rigation season begins	Variable (4/15-5/1)	Pressure chamber values of -12 bars	
oil moisture monitoring nd schedule preparation, ansmission of irrigation chedules	Irrigation start thru October 12, 2003	Weekly irrigation schedules Moisture Data Records Evaporation Reports Seasonal Summaries	19,23
ata compilation and eport preparation	October 12-November 14	Final Feasibility Report	1,00

** This project includes no stand-alone component that could be used as the basis for partial funding; however, the project could be scaled down proportionately based on 100-percent funding for 28 C-Probe stations.

Quarterly Expenditure Projection

Q1: October 1 -December 31, 2003	**$76,400**
Q2: January 1-March 31, 2003	**2,000**
Q3: April 1 - June 30, 2003	**8,442**
Q4: July 1-October 31, 2003	**11,191**

3. Monitoring and Assessment

Not required for Agricultural Feasibility Study Grant Proposals

4. Preliminary Plans and Specifications

Applicable to Proposition 13 Urban Grant construction proposals only.

.

B. Qualifications of Applicants and Cooperators

1. Project Manager

Project Manager Jim Gilmore has served as Program Manager for the San Jacinto Basin RCD and as Team Leader for the district's Irrigation and Nutrient Management Lab for the last 10 years. He is a graduate of California State University at San Luis Obispo with a B.S. in Biological Sciences and minors in Agriculture and English. Prior to 1992, he was Managing Director of the National Coalition for Marine Conservation-Pacific Region and founding director of United Anglers of Southern California. From 1974 through 1981he was the Program Development Specialist (Grants Officer) for the Huntington Beach Union High School District and creator of the Community Environmental Laboratory. Over the last 10 year he has managed the following grant programs for San Jacinto Basin RCD:

Program	**Period**	**Grantor***
Agricultural Irrigation Water Management and System Assessment	July '92 - Present	Eastern Municipal Water District (EMWD)
AG IWM and System Assessment	Jan '94-Dec '01	USBR
Powdery Mildew Management in Winegrapes: Adcon Wx Stn. Network	1996	Dept. of Pesticide Regulation
PRISM Irrigation Scheduling Program	1999 to present	USBR
USDA EQIP Education Program for Growers of Winegrapes, Citrus and Avocados.	2000, 2001	USDA/NRCS
Nitrate Management in Winegrapes	2000, 2001	Dept. of Conservation
Expansion of PRISM Irrigation Scheduling	2001, 2002	Dept. of Conservation

Program

Program	Period	Grantor
Regulated Deficit Irrigation Program	2002	USBR
IWM and System Assessment for Large Commercial Landscapes	2002, 2003	USBR via Eastern Municipal Water District
Irrigation Water Management Hotline (Toll-free scheduling info)	1995-Present	EMWD

- Reference contacts provided upon request

2. Role of External Cooperators

This project is being conducted on behalf of and in cooperation with the Temecula Valley Winegrowers Association. SJBRCD has conducted several programs in cooperation with this growers group and is a member of its Viticulture and Enology Research Committee and Grape Day Planning Committee (annual technical conference and trade show). SJBRCD through the PRISM Program has provided since 1999 irrigation scheduling services to 80 percent of the grower acres in the Valley. This program and the Powdery Mildew monitoring program which established the Adcon weather station network provide the foundation upon which this project proposal has been constructed. SJBRCD works through the VERC to solicit the participation of individual grower members in these cooperative programs. Growers pay no fee for participation in these programs but do agree to share data associated with their vineyards.

C. Benefits and Costs: Agricultural Feasibility Study Grants

1. Budget Breakdown and Justification (for project period 10/1/02- 10/31/03)

   a. Direct Labor Hours and Salary Rates

      1. Project Manager: 2,253 available hrs x 19.65/hr x .25 FTE = $11,068
      2. Clerical Admin: 1,127 available hrs x 14.57/hr x .1 FTE = $1,642

   b. Salaries (see rates specified above)
   c. Benefits
      1. Benefits at rate of 10.875% included in above salary rates.
   d. Travel -- N/A
   e. Supplies and Expendables -- N/A

f. Services or Consultants
   1. Western Farm Services
      a. Equipment Installation, Training:
         $200 per C-Probe site x 28 sites = $5,600

g. Equipment

1. Relay Stations: 4 @ $2,359 each	9,436
2. Add-It sets: 25 @ 820 each =	20,500
3. Rain gauges (flow meters)	
5 @ 390 each =	1,950
4. C-Probe Assemblies	
28 @ 625 each =	17,220
5. C-Probe Sensors	
112 @ 200 each =	22,400
6. C-Probe Diagnostic Box	
1 @ 495 =	495
7. C-Probe Normalization Kit	
1 @ 255 =	255
8. addVANTAGE software package	990
9. Other Direct Costs	
Tax @ 7.75% on equipment and Software	5,677
i. Total Direct Costs (a thru g)	97,233
j. Indirect Costs charged at rate of 6.29% of direct cots exclusive of equipment, software and taxes thereon = 12,710 x .0629 =	800
k. Total Costs =	$98,033

2. Cost-Sharing

Although we have proposed no cost-sharing related to implementation of the C-Probe network, it should be noted that the existing Adcon weather station network and USBR funded Leaf Water Potential Monitoring Program provide effective cost-sharing benefits without which this proposal would not be possible given the additional potential costs. The value of the Adcon weather station network at the time of acquisition in 1996, including the base station was ~ $55,000. The USBR LWP program is funded at $40,000 per season and will be implemented in 2002. Accordingly, there is an effective cost-share contribution of $95,000 already in place awaiting implementation of the C-Probe feasibility study.

3. Benefit Summary and Breakdown
   N/A for Agricultural Feasibility Study Grants

4 Assessment of Costs and Benefits
N/A for Agricultural Feasibility Study Grants

Potential Benefits to be Realized and Information to be Gained

This project will produce significant savings of applied irrigation water and an improvement in overall irrigation efficiency provided that application uniformity is maintained at acceptable levels. These savings will occur because the Regulated Deficit Irrigation strategy being implemented as a component of this study intentionally stresses the vines by reducing applied irrigation water to 60 to 80 percent of full ET, depending on variety, in order to positively influence winegrape chemistry. Prior to the 2002 season, most vineyards in the region were irrigating at 100 percent of ET in the belief that stressing the vines in a Pierce Disease environment would simply accelerate vine death. Accordingly, the project will measure water savings as the difference between water applied at 100 percent of ET and that applied using the RDI strategy on a block by irrigation block basis. The C-Probe network contributes to these savings by imposing the scheduling discipline that has heretofore been absent. Using C-Probes real-time remote sensing capability, we can verify whether the desired irrigation schedule has actually been applied by monitoring automatically irrigation start and stop times. The probes also monitor the depth of water applied in order to prevent deep percolation below the root zone. Scheduling adjustments, when necessary, help to prevent contamination of ground water due to deep percolation of agricultural chemicals being applied through the irrigation system. More importantly, from the growers' point of view, we should be able to distinguish differences in water use patterns and RDI response within management units of different varieties and on different trellis systems. As a result of this study, we should also be able to document the labor savings associated with converting to a remote-sensing soil moisture monitoring system Vs the PRISM system which requires in-field, station-by-station monitoring using a portable gauge.

Finally, as a result of this study, we should be able to determine whether the combination of labor and water savings associated with this project are sufficient to justify expansion of the C-Probe network to full growing region scale (100 stations). A key determination here, is whether our results would qualify the program for support via a Proposition 13 Agricultural Water Conservation Loan.

Benefit Realized and Information Gained versus Costs

Assuming this application is approved, the total additional cost of converting the PRISM system to a remote sensing C-Probe network would be about $150,000 for a total project cost, including this component of near $250,000 (higher volume purchases of C-Probe equipment result in a 10 percent discount according to Jeff Diebert of Western Farm Services). Operational costs for the irrigation scheduling component, due to the conversion to a remote sensing network Vs in-field monitoring, would be reduced from its present cost of $38,000 per season to $7,500. The savings would be applied to full implementation of the Leaf Water Potential Measurement program. Early on the primary benefits of a full-scale C-Probe network accrue as water savings in the range of $183,200

to $520,000. This is based on water costs of approximately $400/AF and a 20 to 40 percent reduction in water use from full ET over 2,500 acres. The actual value depends on relative maturity of the vines and the proportion of red Vs white varieties, a dynamic number that won't be finalized until replanting is completed; however, the trend seems to indicate a shift toward red varieties which are generally more resistant to Pierce Disease and which respond favorably to a more severe RDI protocol. Implementation of Regulated Deficit Irrigation strategies, aided by the real-time soil moisture monitoring capability of the C-Probe system should allow growers to develop with experience new information providing answers to the following questions:

- Can the target vine stress levels as measured by pressure chamber be established and controlled by maintaining a given soil moisture level? Can vine stress levels and soil moisture content be correlated? Do vines of different varieties or on different trellis systems behave differently?
- How does the imposition of mild, moderate or severe vine water stress affect winegrape chemistry? Are the results dependable and repeatable?
- What magnitude of water application adjustment is required to slow or stop shoot growth (in order to control canopy size)? How does this relate to relative vine vigor inherent in certain varieties?
- At what point, within varieties, does RDI adversely affect yield?
- To what extent do other factors such as vine nutrition retard or enhance the desired affects of RDI on winegrape chemistry.

The imposition of RDI is considered a necessary practice in the production of premium winegrapes both in terms of the perception its use creates in the marketplace and the product which forms the basis for the winemakers art. To the extent that the desired winegrape chemistry can be produced in the vineyard, the better the end product which accordingly requires less artificial manipulation by the winemaker. To the extent that this project contributes to an improvement in winegrape quality and reduces the cost of artificial winegrape chemistry manipulation, the better the price area growers can expect to receive for their crop. We estimate ultimately that winegrapes grown under a strict RDI protocol could yield an increase of $200-$400/ton. When extrapolated across the growing region, it would produce an increase in revenues of $2-$4 million

D. Outreach, Community Involvement and Acceptance

The battle against Pierce Disease has been accurately portrayed as a survival issue for Temecula Valley winegrape growers. Temecula citizens share this attitude and related concerns because the community's identity is intimately connected to the wine country. Accordingly, the environmental, agronomic and economics benefits of this project contribute to the enhancement and preservation of a valued lifestyle and its related quality of life. Vineyards which have been destroyed by PD, represent lost tax revenue for state, county and federal governments and a less attractive tourist destination for visitors to the community of Temecula. To the extent that the C-Probe/RDI program, in some small measure, can contribute to a reversal of these negative impacts, the related benefits will accrue to the affected levels of government. Finally, SJBRCD will have successfully responded to a call for assistance by local growers, further strengthening

that relationship while contributing to the preservation of the Winegrape Management Area in the Temecula Valley.

Community outreach occurs through the forum of the Temecula Valley Winegrowers Association which sponsors a full schedule of events for members and the general community throughout the year. SJBRCD participates in this organization as a member of the TVWA Viticulture and Enology Research Committee and Grape Day Planning Committee.